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ABSTRACT

Little is known of children's knowledge of text search processes and the role of metacognition. This study examined middle school students' knowledge of text search strategies and the correlation between metacognitive awareness and search efficiency. Sixty-nine students in sixth, seventh, and eighth grade were observed as they searched in an informational book for answers to six questions. For five questions, students could use a relatively simple locate strategy because the questions contained terms that were indexed in the book. The sixth question required students to generate a term that might be located in either the index or table of contents. Students also completed a survey assessing their awareness of the relative utility of text features for locating information. The survey asked students to list text features that they would use to locate an answer to a specific question and to rate the utility of 15 standard textbook features. Students also completed the Metacognitive Awareness Inventory, a questionnaire designed to measure regulation and knowledge of cognition. The findings indicated that students were successful and fast at locating answers to the five questions containing indexed terms, but much less successful with a question that did not lead to an entry in the index. The strategies used to locate the information were rated on a scale comparing the students' search to that of an ideal strategy; students were more strategic with indexed questions than with the non-indexed question. The two scales of the Metacognitive Awareness Inventory were correlated with search performance and strategy ratings and were predictive of search efficiency and strategy. (KB)

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Middle School Students' Information-Seeking Skills and Metacognitive Awareness

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Abstract

We studied middle-school students' knowledge of how to search text and the relations between a general measure of metacognitive awareness and measures of search efficiency. 69 students in grades six, seven, and eight were observed as they searched for answers to six questions in an informational book. For five of the questions, students could use a relatively simple locate strategy because the questions contained terms that were indexed in the book. The sixth question was more complex; it required the students to generate a term that might be located in the index or table of contents. Students also completed a survey that assessed awareness of the relative utility of text features for locating information. The survey asked students to list text features that they would use to locate an answer to a specific question and to rate the utility of a list of 15 standard textbook features such as the preface, table of contents, and boldface terms. Students completed the Metacognitive Awareness Inventory, a questionnaire designed to measure regulation and knowledge of cognition. Students were successful and fast at locating answers to the 5 questions that contained indexed terms, but much less successful with a question that did not lead to an entry in the index. The strategies that students used to locate the information were rated on a scale that compares the students' searching to that of an ideal strategy; students were more strategic with indexed than with the non-indexed question. The two scales of the Metacognitive Awareness Inventory (regulation and awareness of cognition) were correlated with search performance and strategy rating. Results indicate the importance of metacognitive awareness in information seeking, that students have some knowledge of book structure and that they use this knowledge when searching text.

Purpose

The ability to locate information is an essential literacy task that is performed frequently in workplace and school contexts, yet it is a difficult task for many people, as indicated by literacy surveys and experimental research. Locating information in text may be a particularly challenging task because it involves both search and comprehension processes (Robinson & Skinner, 1996). The search process has been compared to a goal-directed problem-solving process (Guthrie & Mosenthal, 1987; Moore, 1995) that involves selection of specific sections of text to inspect carefully in order to decide whether they contain the sought-after information.

Very little is known about children's knowledge of text search processes and the role of metacognition in locating information in text. Research with adults suggests that planning plays an important role in information seeking (deciding on a series of steps to guide the search and choosing text carefully).

The first purpose of the present study was to describe middle-school students' model of text search and, second, to examine the relationship between metacognitive awareness, self-reported knowledge of the structure of informational books, and measures of search efficiency.

Method

69 students in grades 6, 7, and 8 were observed as they searched for answers to six questions in an informational book. For five of the questions, students could use a relatively simple locate strategy because the questions contained terms that were indexed in the book. The sixth question was more complex; it required the students to generate a term that might be located in the index or table of contents.

Students also completed the Text Features Survey (Yussen, Stright, & Payne, 1993) modified for youth, to assess students' awareness of the relative utility of text features for locating information. The survey first required students to list text features that they would use to locate an answer to a specific question. Students were then asked to rate the usefulness of a list of 15 standard textbook features such as the preface, table of contents, and boldface terms for locating information.

Students completed the Metacognitive Awareness Inventory (Schraw & Dennison, 1994), a 52-item Likert-style questionnaire designed to measure regulation and knowledge of cognition.

Search Questions

Indexed:

- Which animal gave Canary Islands their name?

  Answer: dogs
- Which breed of dog does not bark?

  Answer: basenji
- What is the estimated number of years before Niagara Falls disappears?

  Answer: 22,800
- What animal is the 10th smartest?

  Answer: pig
- Name two colors of car that are the safest.

  Answer: blue and yellow

Non-Indexed:

- What is the name of substance released that makes eyes tear when working with onions?

  Answer: a sulfur compound or thio-propanal-s-oxide

Results

Students' model of text features. Table 1 lists the mean rating that students gave each of the textbook features. Scores could range from 1 (would never use) to 10 (would always use). The number of students who listed each textbook feature as something they would use to locate information is included. 6 students listed no text features and 9 listed only one. 45/69 students listed either 2 or 3 features of a book that they would use to locate information. The 15 students who did not list the index as something that they would use for finding information gave the subject index a mean rating of 5.4, compared to a mean of 8.7 by the students who had listed the index (t (67) = 4.83, p = .001). Students who listed the index as a part of a book that is helpful for finding information actually used it a mean of 3.7 (s = 2.9) times as they searched for answers to the indexed questions. Those students who did not list the index as a way of finding information used the index less frequently as they searched the book (M = 1.9, s = 3.0; t (67) = 2.1, p = .039).

Table 1

Text Features Survey Results

Feature	Rating (max = 10)	# Students Listed Item
Table of Contents	8.7 (1.8)	53
Subject Index	8.0 (2.7)	54 (index)
Headings in Chapters	6.8 (2.4)	8
Boldface Terms	5.9 (2.7)	11
Glossary	5.8 (2.8)	8
Chapter Summaries	5.4 (2.8)	9
Chapter Tables	5.3 (2.4)	2
References	4.7 (2.7)	1
Recommended Readings	4.5 (2.5)	2
Figures	4.4 (2.6)	3
Author Index	3.4 (2.4)	0
Book Cover	3.3 (2.6)	3
Title Page	2.8 (1.9)	2
Preface	2.5 (1.8)	0
Acknowledgements	1.9 (1.5)	0

Search performance. Students were quite successful at locating the answers to the 5 questions that contained indexed terms. The mean number of correct answers was 4.2 (s = 1.0). Only 9 students stopped searching on any of the indexed questions. The mean search time was 2 minutes 2 seconds (s = 55 seconds) per indexed question. There were no grade differences on either search accuracy or search time.

Students had difficulty finding the answer to the question that did not have an indexed term. Only 26 of the 69 students found the correct answer. Those students who found the answer took a mean of 4 minutes 14 seconds (s = 1 minute 52 seconds).

Search strategy. The strategy that the students used to locate information was scored according to a coding scheme that compared the student's strategy to an ideal search strategy (see Appendix A). The maximum attainable score was 20 for the indexed questions and 25 for the non-indexed question. With the indexed questions, the mean score was 14.2/20 (s = 3.6), indicating that most of the students were using an efficient search strategy. Students were less strategic with the non-indexed question (M = 12.3/25, s = 6.3). This represents a statistically reliable difference ($t(67) = 5.68$, $p < .001$).

With the non-indexed question, if the student could not generate a term to locate in the index, a better strategy would be to use the Table of Contents. In fact, only 59.7% of the students did use the Table of Contents for this question.

Metacognitive awareness and search performance The mean score on the Knowledge of Cognition sub-scale was 65 (s = 8.2), where 85 was the maximum possible score. The mean score on the Regulation of Cognition sub-scale was 121 (s = 17.6); maximum attainable score was 175.

Table 2

Correlations of Regulation of Cognition and Knowledge of Cognition with Information-Seeking Measures (indexed questions)

	Regulation of Cognition	Knowledge of Cognition
Search Accuracy	.15	.38***
Search Time	-.32*	-.36**
Strategy Rating	.26*	.30*

* $p < .05$

** $p < .01$

*** $p < .001$

Conclusions:

- Middle school students have a mental model of a book that includes information about the utility of organizers. This model is reflected in how students use a textbook for locating information and how they rate the utility of text features. The majority of students listed only the Table of Contents and Index as features that they would use for locating information, indicating a limited knowledge of other text organizers that can be used as search aids.

- A general metacognitive measure was predictive of search efficiency and search strategy. Locating information in text is an activity that requires planning and judging whether a goal has been reached.

- Students experienced difficulty with a search task that did not tie in directly with a text organizer (the index). A majority of the students could not find the answer to the question and were less strategic in their approach to searching. This is a common occurrence, even with skilled adult learners. Part of the problem here is that 40% of the students did not use the table of contents when the question did not contain an indexed term.

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Appendix A

Coding Scheme for Search Strategies[a]

Non-indexed Question:

Order of Behavior	Behavior	Rating
First	Search Table of Contents	5
	Search Index	5
	Flip through text	1
	Examine Relevant Chapter Section	0
	Examine Relevant Chapter	0
	Examine Irrelevant Text Pages	0
	Record an Answer	0
	Quit/out of time	0
Second	Examine Relevant Chapter Section	5
	Examine Relevant Chapter	4
	Search Table of Contents	4
	Search Index	4
	Examine Irrelevant Text Pages	0
	Flip through text	0
	Record an Answer	0
	Quit/out of time	0
Third	Record an Answer	5
	Examine Relevant Chapter Section	4
	Examine Relevant Chapter	3
	Search Table of Contents	3
	Search Index	3
	Examine Irrelevant Text Pages	0
	Flip through Text	0
	Quit/out of time	0
Fourth	(Nothing)	5
	Record an Answer	4
	Examine Relevant Chapter Section	3
	Examine Relevant Chapter	2
	Search Table of Contents	2
	Search Index	2
	Examine Irrelevant Text Pages	0
	Flip through Text	0
	Quit/out of time	0
Fifth	(Nothing)	5
	Record an Answer	3
	Examine Relevant Chapter Section	2
	Examine Relevant Chapter	1
	Search Table of Contents	1
	Search Index	1
	Examine Irrelevant Text Pages	0
	Flip through Text	0
	Quit/out of time	0

Indexed Questions:

Order of Behavior	Behavior	Rating
First	Search Index	5
	Search Table of Contents	4
	Flip through text	1
	Examine key/indexed pages	0
	Examine relevant chapter	0
	Examine Irrelevant Text Pages	0
	Record an Answer	0
	Quit/out of time	0
Second	Examine key/indexed pages	5
	Examine Relevant Chapter	3
	Search Index	3
	Search Table of Contents	3
	Examine Irrelevant Text Pages	0
	Flip through text	0
	Record an Answer	0
	Quit/out of time	0
Third	Record an Answer	5
	Examine key/indexed pages	3
	Examine Relevant Chapter	2
	Search Index	2
	Search Table of Contents	2
	Examine Irrelevant Text Pages	0
	Flip through Text	0
	Quit/out of time	0
Fourth	(Nothing)	5
	Record an Answer	3
	Examine key/indexed pages	2
	Examine Relevant Chapter	1
	Search Index	1
	Search Table of Contents	1
	Examine Irrelevant Text Pages	0
	Flip through Text	0
	Quit/out of time	0

[a] Adapted from Dreher & Guthrie (1990).